REMARKS

I. Introduction

In response to the pending final Office Action, Applicants have cancelled claims 4, 5 and 9, without prejudice. New claims 14-17 have been added. Support for new claims 14-17 may be found, for example, on page 8, lines 8-15 of the specification. Applicants have taken care to avoid the introduction of new matter.

A Request for Continued Examination (RCE) is being filed concurrently herewith.

For the reasons set forth below, Applicants respectfully submit that all pending claims as currently amended are patentable over the cited prior art.

II. The Rejection Of Claims 1 And 4-9 Under 35 U.S.C. § 103

Claims 1, 6 and 8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Inoue (USP 5,707,756) in view of Goto et al. (US 2002/0094481); claims 4, 5 and 9 as being unpatentable over Inoue in view of Goto and further in view of Shoichiro et al. (JP 2002-319398); and claim 7 as being unpatentable over Inoue in view of Goto and further in view of Fernandez et al. (USP No. 5,637,413). As claims 4, 5 and 9 have been cancelled, the rejection over Inoue in view of Goto and Shoichiro is now moot. Applicants respectfully submit that claims 1 and 6-8 are non-obvious over the cited prior art for at least the following reasons.

With regard to the present disclosure, independent claim 1 recites, in-part, a non-aqueous electrolyte secondary battery comprising positive and negative electrode material mixture layers. The end of charge voltage of the non-aqueous electrolyte secondary battery is set to 4.25 to 4.5 V in normal operation, and the ratio R:Wp/Wn is 1.5 to 2.2 in the area where the positive electrode material mixture layer and the negative electrode material mixture layer are opposed to each

other, the Wp being the weight of the positive electrode active material contained in the positive electrode material mixture layer per unit opposed area, the Wn being the weight of the negative electrode active material contained in the negative electrode material mixture layer per unit opposed area.

In the Office Action, it is asserted that because Inoue teaches that the ratio of the contents of the positive and negative active material can be modified to improve capacity, then it would be obvious to optimize these values and thereby achieve the claimed ratio of Wp/Wn. Moreover, it is also asserted that Inoue does not teach a value of Wp/Wn over 2.2, as suggested in the previous Response. Applicants respectfully disagree.

As is well known, the higher a battery is charged to an end-of-charge voltage, the higher the number of lithium ions that are released from the positive electrode active material. This causes an increase in the load of the positive electrode, and leads to deterioration of the battery. The smaller a Wp/Wn ratio value, the more likely a deterioration will occur. Thus, a skilled artisan would prefer to keep the Wp/Wn value as high as possible in order to avoid deterioration.

Inoue fails to teach any specific value for Wp/Wn. Inoue merely teaches optimizing the positive/negative active material values in order to improve capacity, cycle life and safety. Since Inoue teaches charge and discharge at 2.7-4.3 V, then Inoue would have a value of Wp/Wn in a range sufficiently large to avoid deterioration issues. As it is well known that conventional batteries have Wp/Wn ratios over 2.2 for this reason, a skilled artisan would not use a Wp/Wn ratio of 1.5 - 2.2 based on the teachings of Inoue.

In addition, as shown in Table 2 of the present disclosure, when the end-of-charge voltage is 4.25 V, it is difficult to assert the difference among the capacity retention rates based on the difference among the ratios Wp/Wn. However, with respect to the thermorunaway

threshold temperature, there is sufficient difference in effect even at 4.25 V. For example, in Table 3, comparing batteries 2-4 shows that at an end-of-charge voltage of 4.25 - 4.5 V, the thermorunaway threshold temperature increases as much as by 7-10 °C when Wp/Wn increases from 1.40 to 1.50, whereas is increases only by 4-5 °C when Wp/Wn increases from 1.30 to 1.40, which is the same increase. Moreover, batteries 7 and 8 show a thermorunaway threshold temperature when Wp/Wn is 2.20 increases by as much as 10-17 °C as compared to a Wp/Wn of 2.30. Thus, the claimed range of Wp/Wn shows unexpected results as compared to values outside the claimed range.

Therefore, it is clear that Inoue, alone or in combination with Goto, fails to teach or suggest all of the limitations of claim 1 of the present disclosure.

In order to establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. As Inoue and Goto, at a minimum, fail to disclose a non-aqueous electrolyte secondary battery comprising positive and negative electrode material mixture layers, wherein the end of charge voltage of the non-aqueous electrolyte secondary battery is set to 4.25 to 4.5 V in normal operation, and the ratio R:Wp/Wn is 1.5 to 2.2 in the area where the positive electrode material mixture layer and the negative electrode material mixture layer are opposed to each other, it is submitted that Inoue and Goto do not render claim 1 obvious. Accordingly, claim 1 is allowable and patentable and as such, it is respectfully requested that the § 103 rejection of claim 1 be withdrawn.

III. All Dependent Claims Are Allowable Because The Independent Claim From Which They Depend Is Allowable

Under Federal Circuit guidelines, a dependent claim is nonobvious if the independent claim upon which it depends is allowable because all the limitations of the independent claim are

contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819 F.2d at 1100, 1108 (Fed. Cir. 1987). Accordingly, as claim 1 is patentable for the reasons set forth above, it is respectfully submitted that all pending dependent claims are also in condition for allowance.

Moreover, new claims 14-17 establish values for end of charge voltage of the non-aqueous electrolyte secondary battery is set to higher than 4.30 V and 4.5 V or lower (claims 14 and 16) and from 4.35 V to 4.5 V (claims 15 and 17).

As is shown for batteries 2-4 in Table 2, at an end-of-charge voltage of higher than 4.25 V, the capacity retention rate improves as much as by 4-6% when Wp/Wn increases from 1.40 to 1.50. In contrast, for an increase of from 1.30 to 1.40, the improvement is only 1-2%. Thus, the increase from 1.40 to 1.50 is 2-6 times higher than the increase from 1.30 to 1.40.

Further, Table 3 shows that for batteries 2-4, at an end-of-charge voltage higher than 4.25, the thermorunaway threshold temperature increases as much as by 8 or 10 °C for a Wp/Wn increase from 1.40 to 1.50. The corresponding increase for 1.30 to 1.40 is only 4 or 5 °C. Batteries 7 and 8 show that the thermorunaway threshold temperature when Wp/Wn is 2.20 increases by 12 or 17 °C as compared to a Wp/Wn value of 2.30.

Moreover, the Office Action compares batteries 16-17 and 24-25 with battery 29 and suggests that the difference in capacity results is not significant. However, since the Wp/Wn of batteries 16 and 24 is different than that of battery 29, then the comparison is not valid. The valid comparison is between battery 29 and batteries 17 and 25. As is shown in Table 3, battery 29 has a thermorunaway threshold temperature 6-17 °C higher than battery 17 and 8-21 °C higher

than battery 25. Thus, battery 29 exhibits unexpected superior results to batteries outside the claimed range.

In view of at least the above, new claims 14-17 are allowable over the cited prior art.

IV. Conclusion

Having responded to all open issues set forth in the Office Action, it is respectfully submitted that all claims are in condition for allowance.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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